

CROP PRODUCTION POTENTIAL OF THE BROWN
AND DARK BROWN SOIL ZONES

A. A. Guitard, Director
Research Station, Swift Current, Saskatchewan

(Presented to the Soil Fertility Workshop, Saskatoon,
February 6, 1974)

Good agronomy is both a mental attitude and a physical system. It is essentially a process by which crop production potential is allowed maximum expression by minimizing the impact of climatic and soil deficiencies on production. It depends on technology and is sensitive to product demand.

The crop production potential of the Brown and Dark Brown zones of Saskatchewan is limited by several deficiencies in climate and soil. Although these deficiencies vary in degree throughout the two zones, production is generally restricted by:

1. Cold winters
2. Short growing season
3. High winds, particularly during April and May
4. Insufficient moisture particularly during June and July
5. High temperatures during July
6. Unsuitable topography
7. Erodible soil ranging in texture from sand to heavy clay
8. Saline marine shale subsoil
9. Deficiency in phosphorus
10. Deficiency in nitrogen under intensive cropping

With existing genotypes, these production deficiencies generally restrict the crops that can be grown to annual cereals and oilseeds and perennial forages. Because of superior drought resistance, production in the Brown soil zone should center around spring and durum wheat with some production of fall rye, barley, flax and possibly sunflowers. In the Dark Brown soil zone rapeseed and oats can be added to this group. In both zones, grasses and legumes can be seeded for hay and pasture on any of the soils if they are required. They are essential on light soil or steep slopes where annual cultivation causes erosion and on saline seeps or recharge areas. To undertake large scale production of other crops in these two soil zones is not good agronomy and will not allow for maximum expression of the production potential.

For maximum sustained yield, soils used for the production of annual crops must be managed for maximum moisture availability and erosion control and the crops for maximum efficiency of moisture use. The following comments on the management of wheat serve as guidelines for all annuals.

1. Use recommended varieties - the fact that they are recommended guarantees suitable commercial quality and the best possible agronomic adaptability.

2. In view of the strong market demand for 1974 seed on all suitable land where there are 3 inches of available moisture in the top 4 feet of soil.
3. Seed directly into untilled summerfallow or stubble using a double-disc, hoe or shoe drill or a discer-packer combination. The only exception to this is preseeding tillage required for the incorporation of Triallate for wild oat control.
4. Seed to moisture but never cover the seed with more than 2 inches of soil.
5. Seed at 30 pounds per acre.
6. Apply 100 pounds of P_2O_5 to eroded areas once every 5 years. On both summerfallow and stubble apply 15 - 25 pounds P_2O_5 with the seed based on soil test, moisture, crop and variety.
7. On stubble apply 20 - 40 pounds N depending on soil test, moisture, crop and variety. If applying more than 20 pounds, broadcast in the fall or spring.
8. Spray as required to control weeds and insects - weeds use large amounts of soil moisture and insects reduce efficiency of moisture use.
9. When harvesting leave the stubble as long as possible.
10. Do not cultivate in the fall - attached stubble standing upright holds the most snow and gives best protection from erosion. Spray to control winter annual weeds.
11. During winter ridge snow to hold snow and control spring run-off.
12. Seed again to wheat if moisture adequate and market promising.
13. If moisture not adequate, summerfallow using chemical weed control as a substitute for cultivation - cultivation destroys stubble and degrades the soil physically and chemically.

For maximum sustained yield over a period of 10 or more years, perennial grasses and legumes for hay and pasture must be managed for maximum moisture uptake by the soil, maximum water use by the plants and maximum retrieval of high quality forage. The following management practices are recommended for full expression of the production potential.

1. Seed an alfalfa-crested wheatgrass mixture for hay and pasture or an alfalfa-Russian wild ryegrass mixture for pasture only, except where the soil is saline. Here seed Orbit tall wheatgrass.
2. Seed recommended varieties - this is even more important than with annuals because the stands are being established for 10 or more years.
3. Seed in the fall into cereal stubble that has been sprayed to control winter annual weeds. Seeding can be done in the spring into sprayed stubble or summerfallow but there is less assurance of suitable moisture for germination.

4. On level or gently sloping land seed the legumes and grass separately in parallel rows spaced 2 feet apart.
5. On moderately or steeply sloping land seed the legumes and grass separately in crossed rows spaced 3 feet apart.
6. Seed at a rate that will guarantee a minimum density of 2 plants per foot of row. Because of low rates of germination and establishment, this appears to require a minimum of 20 seeds per row.
7. Prior to seeding, incorporate into the soil enough phosphorus for the expected life of the stand. This could be up to 200 pounds per acre of P_2O_5 .
8. Band a small amount of nitrogen with the seed of grasses.
9. Seed not more than 1 inch deep into a firm, moist, weed-free seedbed.
10. Do not use a companion crop.
11. Do not remove foliage during the establishment year.
12. To suppress seed heads in pasture, completely graze off the foliage by early June each year.
13. When cutting for hay, cut as close to the ground as possible to obtain maximum yield of forage.
14. If there is regrowth, leave it for winter pasture or, if not required for pasture, leave it in the field to trap snow.
15. Insure an adequate supply of winter feed by growing an annual cereal, preferably oats, that can be harvested for feed if required.

DISCUSSION FROM DR. ART GUITARD'S PAPER ENTITLED: "CROP PRODUCTION POTENTIAL OF THE BROWN AND DARK BROWN SOIL ZONES"

Question: How often can you spray without doing damage to the soil?

Hank Anderson: Well, first of all, let me say that Dr. Guitard is referring to chemicals such as 2,4-D and MCPA, and I think that the number of times that we need to spray, say 4 to 5 at the very most on summerfallow, there would be no residual effect. Now I think if you went on at very heavy rates over a number of years you might have a residue problem, but certainly not at the 6-8 oz. rate which we recommend.

Art Guitard: I think the best point to make here is that in fact when looking at grain production, we not only consider weed control, we check damage to the soil, we consider textural effects, and all these other things, and we are not, in good conscience, going to make any recommendation that will cause any damage to the soil. Now I know that some of the environmentalists would disagree with this statement but this is another issue.

Question: Art, are you going strong with the idea, in forage crops, of loading up the soil with nitrogen at the time of seeding with massive applications of nitrogen to have it ready for the moisture when it comes along?

Art Guitard: I don't think fully, although we are giving some consideration to this. It might appear that I am evading the answer, which really in fact I am. We are going along with the concept of loading up the soil with phosphorus for a 6-year period or the expected life of the stand, but we are not loading up appreciably with nitrogen even though we know that nitrogen, if not used, will stay there and be available. We are looking at loading the soil to supply the crop needs for a period of approximately 3 to 4 years. We are currently looking at the economics of this and under our

conditions of moisture we are probably going to have to take off about five crops to hit the break even point and get back the money invested in fertilizer.

Don Read: We have some crops that have returned our investment in 2 to 3 crops but we were fairly fortunate in those.

Art Guitard: Yes, but we have others that are now into their fifth and sixth years and still have not hit the break even point, even though they are still giving a very small response, and there appears to be no chance that they will. So it really boils down to the question "Do you want to invest in 1974 and have to wait until 1980 to recover the cost of your nitrogen?" Now, I am talking about a price of \$30 to \$40 per ton for hay and right now we are in a situation where the going price on hay is about \$70 per ton. This creates a whole new economic situation. If people knew that hay was going to remain at \$70 a ton for the next four years, they would load up with nitrogen even although the moisture situation is somewhat poor at the moment.

Question: Your figures here for summerfallow and stubble crops, I assume that fertilizer was not used.

Art Guitard: Yes it was.

Hank Anderson: These crops were fertilized up to the levels recommended according to soil test, on summerfallow phosphorus was generally added and on stubble both phosphorus and nitrogen were commonly required.

CROP MANAGEMENT ON THE PARKLAND SOILS OF SASKATCHEWAN

K. E. Bowren

A review of data tabulated by the Saskatchewan Wheat Pool indicates that the average yields in the Parkbelt area of Saskatchewan over the past nine years were approximately as follows:

Approximate Average Yields (Crop Districts 5-9)
1965 - 1973

Crop	Yield bu/ac	Range in Yield
Wheat	25	21 (1967) to 31 (1966)
Barley	40	30 (1967) to 46 (1971)
Flax	14	11 (1967) to 17 (1970)
Rapeseed	18	16 (1973) to 20 (1966)

With improved cropping practises and improved incentives for increased production I think it should be possible to increase the yields by at least 10 percent if the growing conditions are normal and if the required inputs are available.

Improved crop management is one way to improve these yields. Good management means knowing what to do and where, how and when to do it. It means putting all the best production technology together to produce maximum crop yields over an extended period of time.

There are a range of soils in northern Saskatchewan and a wide variety of crops that can be grown. Each of these soils are associated with a specific set of climatic conditions and the production of each crop requires special consideration.

Soil erosion from both wind and water is a problem on most of the soils in the area. If the production capacity of these soils is to be